

## REMARKS

In response to the Office Action mailed August 20, 2010, Applicants hereby request reconsideration of the rejections based upon the claim amendments and arguments submitted herewith. Claims 10-18, 21-24, and 37-49 were last presented for examination, of which all were rejected, with the following issues being raised:

1. Claims 10-14, 18, 21, 37-41, 45, and 46 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,961,541 to Ferrati ("Ferrati") in view of U.S. Patent No. 6,478,652 to Van der Linde ("Van der Linde"), further in view of U.S. Patent No. 4,739,692 to Wassam et al. ("Wassam"), and further in view of U.S. Patent No. 6,067,892 to Erickson ("Erickson"); and
2. Claims 15, 17, 22-24, 42, 44, and 47-49 were rejected under 35 U.S.C. § 103(a) as obvious over Ferrati in view of Van der Linde, further in view of Wassam, further in view of Erickson, and further in view of U.S. Patent No. 5,158,005 to Negishi et al. ("Negishi").

Following the above amendments to the claims, claims 10-18, 21-24, and 37-49 remain pending in the application, with claims 10 and 37 being independent.

### Obviousness Rejection

Claim 10 was rejected as obvious over Ferrati in view of Van der Linde, further in view of Wassam, and further in view of Erickson. A *prima facie* case of obviousness requires that each and every limitation of the claim must be taught or disclosed by the cited combination. MPEP 2142. In addition, the prior art must be considered in its entirety, including portions that teach away from the claimed invention. MPEP 2141.02(IV). Claim 10 is directed toward an artificial muscle system in which each muscle actuator includes "a mechanical device coupled in parallel with and between the ends of the inner bladder such contraction of the braided material compresses the mechanical device, and the mechanical device expands the ends longitudinally when the inner bladder is depressurized". The cited combination does not teach this limitation.

The Office Action relies on Erickson to teach this feature, but not directly. Rather, the Office Action cites the following portion of Erickson in support this assertion:

"Since the artificial muscle assembly of the present invention can only selectively retract the tendon inwardly, ***an external force must be provided to extend the tendon outwardly.*** For instance, an opposed artificial muscle assembly, a spring, gravity, an actuator and/or linkage may be employed which produces the desired extension displacement." (Emphasis added.)

Erickson, column 8, lines 4-10. Most notably here, Erickson teaches that an ***external force*** is necessary to extend the tendon outwardly. The mechanical device of claim 10 is positioned between the ends of the inner bladder, so that it exerts an outward force on each end, thus making the force exerted by the mechanical device an ***internal force.***

The difference between the arrangement as taught by Erickson and the artificial muscle of claim 10 is best exemplified when each respective artificial muscle assembly is not connected to any external structure. Without the external structure, the external force described by Erickson is useless in extending the tendon. This is because the external force is an arrangement of forces in series, requiring one end of the tendon to be held in place by the external structure, while the external force is exerted between the other end of the tendon and the external structure. This arrangement is shown in Van der Linde (Figs. 1 & 2: springs 10, 11 are coupled between two parts of the external structure), in Erickson (Figs. 1A & 1B: tendons 20 & 20' are coupled through the external structure 21 of the robotic device), and in Wassam (Fig. 10: the McKibben-type actuators 41 are all coupled through the external structure). In essence, all prior art of record *requires* external structure to enable extension of a contracting actuator (such as a McKibben actuator). The statements cited to In Erickson serve to reinforce this line of teaching in the prior art.

In contrast, with the mechanical device coupled between the ends of the inner bladder as recited in claim 10, no external structure is necessary for this artificial muscle to contract and expand. Pressurization of the bladder causes the braided material to contract the ends of the bladder, and the mechanical device expands the ends of the bladder automatically when the bladder is depressurized. *No external structure is needed* for expansion of the bladder. This provides the claimed artificial muscle system

with significant advantages over the prior art of record in that the claimed system can be more compact and the control mechanisms, such as eliminating the need for multiple pneumatic sources to pressurize opposing bladders. For these reasons, the cited combination does not establish a *prima facie* case of obviousness over claim 10.

Claim 37 was rejected as obvious over the same combination as claim 10. Claim 37 also recites “a mechanical device coupled in parallel with and between the ends of the inner bladder such that contraction of the braided material compresses the mechanical device, and the mechanical device expands the ends longitudinally when the inner bladder is depressurized.” Thus, for the same reason as stated above for claim 10, the cited combination does not establish a *prima facie* case of obviousness over claim 37.

Each of the other claims in the application depend from one of claims 10 and 37, and each were rejected as obvious using the same base combination. Where other art is cited, that art does not overcome the deficiency of the base combination. Thus, for the same reasons as stated above, a *prima facie* case of obvious has not been established over any of these dependent claims.

### **Conclusion**

For the foregoing reasons, Applicant requests reconsideration of the rejections.

A 2 month extension of time is hereby requested pursuant to 37 C.F.R. §1.136(a), for which the appropriate fee is submitted herewith. The undersigned believes no additional extensions or fees are due with this response. However, if an additional extension is needed or a fee is due, please consider this a request therefor and charge Deposit Account No. 03-2775, under Order No. 09049-00004-US1, from which the undersigned is authorized to draw.

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Respectfully submitted,

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